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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,134	10/16/2003	Won-Cheol Jeong	5649-1190	8253

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EXAMINER

TRAN, MAI HUONG C

ART UNIT PAPER NUMBER

2818

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/687,134

Applicant(s)

JEONG, WON-CHEOL

Examiner

Mai-Huong Tran

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/13/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restriction***

Application's election without traverse of Group I (Claims 1-15) drawn to a semiconductor device is acknowledged for prosecution in the subject application. Accordingly, claims 16-28 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Applicants have the right to file a divisional application covering the subject matter of the non-elected claims.

### **Claim Rejections - 35 U.S.C. § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11 and 13-15 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,697,294 to Qi et al. in view of Schwarz (US 6,891,193).

Regarding to claim 1, Qi discloses a magnetic memory comprising a plurality of digit lines 720; and magnetic tunnel junctions (MTJs) 12 between the bit lines 24 and the digit lines 26 (col. 2, lines 1-12, fig. 1, col. 11, lines 29-41, fig. 7).

Qi does not disclose a plurality of bit lines, wherein the digit lines and the bit lines intersect each other at an oblique angle. However, Schwarz teaches a plurality of bit lines, wherein the digit lines and the bit lines intersect each other at an oblique angle (col. 6, lines 3-10).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the digit lines and the bit lines intersect each other at an oblique angle, as taught by Schwarz, in order to develop an MRAM device configuration that further reduces the current needed to switch magnetic directions of MRAM cell junctions and that offers more accurate and uniform write selectivity within an MRAM array (col. 2, lines 44-49, figs. 1-8).

Regarding to claim 2, Schwarz discloses the magnetic memory wherein the digit lines and the bit lines intersect each other at an oblique angle of between 15 degrees to 75 degrees ((col. 6, lines 3-10).

Regarding to claim 3, Qi discloses the magnetic memory wherein the MTJs are directly connected to the bit lines, and are spaced apart from the digit lines (col. 2, lines 1-12, fig. 1).

Regarding to claim 4, Qi discloses the magnetic memory further comprising a plurality of cell transistors, wherein the cell transistors are arrayed along a row direction and a column direction, wherein the cell transistors comprise a gate electrode, a source region and a drain region, and wherein the gate electrodes of the cell transistors are connected to each other through a plurality of word lines (figs. 6, 7, 16).

Regarding to claim 5, Qi discloses the magnetic memory wherein the digit lines are parallel to the word lines (fig. 6). Qi in view of Schwarz discloses the bit lines intersect the digit lines at an oblique angle (col. 6, lines 5-10). However, Qi in view of Schwarz does not disclose the bit lines intersect the word lines at an oblique angle.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the bit lines intersect the word lines at an oblique angle, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Regarding to claim 6, Qi in view of Schwarz discloses the claimed invention except for the magnetic memory wherein the bit lines diagonally connect the drain regions of the cell transistors to each other.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the bit lines diagonally connect the drain regions of the cell

transistors to each other, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Regarding to claim 7, Schwarz discloses the magnetic memory wherein the bit lines zigzag to connect the drain regions of the cell transistors to each other (fig. 7).

Regarding to claim 8, Qi discloses the magnetic memory wherein the bit lines intersect the word lines perpendicularly (col. 2, lines 1-12), and Schwarz discloses the digit lines intersect the word lines at an oblique angle (col. 6, lines 6-10).

Regarding to claim 9, Qi in view of Schwarz discloses the claimed invention except for the magnetic memory wherein the digit lines diagonally intersect the cell transistors.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the digit lines diagonally intersect the cell transistors, since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

Regarding to claim 10, Schwarz discloses the magnetic memory wherein the digit lines intersect the cell transistors in a zigzag pattern (fig. 7).

Regarding to claim 11, Qi discloses the magnetic memory wherein the MTJs comprise a pinning layer, a fixed layer, an insulating layer and a free layer (col. 1, lines 40-54).

Regarding to claim 13, Qi discloses the magnetic memory wherein the MTJs have a rectangular shape (fig. 1).

Regarding to claims 14 and 15, Qi in view of Schwarz discloses the claimed invention except for the magnetic memory wherein the MTJs have a parallelogram shape or a parallelogram shape with rounded corner portions.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the shape of the MTJs from rectangular to parallelogram or a parallelogram with rounded corner portions.

Claim 12 is rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,697,294 to Qi et al. in view of Schwarz (US 6,891,193) and further in view of Parkin et al. (6,518,588).

Regarding to claim 12, Qi in view of Schwarz discloses the claimed invention except for the magnetic memory wherein the fixed layer comprises a lower ferromagnetic film, a ruthenium film and an upper ferromagnetic film. However, Parkin teaches the

fixed layer comprises a lower ferromagnetic film, a ruthenium film and an upper ferromagnetic film (col. 4, lines 53-57).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the fixed layer comprising a lower ferromagnetic film, a ruthenium film and an upper ferromagnetic film, as taught by Parkin in order to form MTJs that are promising candidates for nonvolatile memory storage cells to enable a dense, fast, nonvolatile magnetic random access memory array (col. 1, lines 20-23).

### **Conclusion**

Any inquiry concerning this communication on earlier communications from the examiner should be directed to Mai-Huong Tran, (571) 272-1796. The examiner can normally be reached on Monday-Thursday from 8:00 AM to 6:30 PM. The examiner's supervisor, David Nelms can be reached on (571) 272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you



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have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be the initials 'MH'.A handwritten signature in black ink, appearing to be 'Mai-Huong Tran'.

Mai-Huong Tran